REMARKS

1. Office Action

The amendments being submitted are in reference to the amendment filed on 02/21/2006.

2. Office Action

Claims 1-6 are amended to address your objections and recommendations.

3. Information Disclosure Statement

References are listed on form PTO/SB/08a for patents and on form PTO/SB/08b for technical articles which forms are replacements for form PTO-1449.

4. Drawings

Figure 1-2 are designated as "Prior Art" in their legends. Corrected drawings are labeled as "Deleted Sheet" in their top margins and replacement sheets are labeled as "Replacement Sheet" in their top margins.

5. Drawings

Corrected original sheets are labeled as "Deleted Sheet" and corrected sheets are labeled as "Replacement Sheet" in the top margins. Drawings 1-8 are the originals. Shading is removed from drawings 1-5 and drawing 2 has a correction in element 8. Original drawings as part of the specification have their cross-out markings removed.

6. Drawings

New drawings 5B-5L have been deleted since they list the Matlab software used to calculate performance in the specification and are objected to by the examiner as not being supported by the original specification.

Remaining drawings 1-8 are the original drawings with editing corrections and corrections recommended in your "Office Action" and are consecutively numbered from 1-8. No drawings have been deleted.

7. Specification

The abstract of the disclosure has been amended to follow your guidelines. As it now reads the abstract describes the enclosure sufficiently to assist the reader in deciding if there is a need to consult the full patent in that it identifies the combined requirements for a least squares LS solution for Wavelets and finite impulse response FIR filters that include requirements not currently available in FIR design algorithms, it points out that the harmonics of the Wavelets are the design coordinates being optimized and these are mapped into the FIR time response for implementation, and it points out that these harmonic design coordinates provide a single design to generate Wavelets at arbitrary parameters which capability is not currently available with any design algorithm.

8. Specification

The amended abstract has been limited to 144 words.

9. Claim Objections

The referenced "for" and "means for generating complex wavelet waveform and filters" have been removed in the amended claim 1 which lists the steps required to implement the iterative eigenvalue least squares LS algorithm derived in the specification.

10. Claim Objections

Objections to claims 3-4 are believed to have been corrected in the amended claims 1-6. Claim 1 lists the detailed steps in the method claimed for generating the digital mother

Wavelet at baseband using an iterative eigenvalue least squares LS algorithm. Claims 3-4 list the steps and design for generating multi-resolution Wavelets from the mother Wavelets in claims 1-2.

11. Claim Rejections - 35 USC § 112

Requirements for one or more of the claims "particularly pointing out and distinctly claiming the subject matter which the appliant regards as his invention" are believed to be met by the amended claims 1-6. Claims 1-2 list the steps in the method for calculating the mother Wavelet time response $\psi(n)$ using the design harmonic coordinates $\psi_k(k)$ and claims 3-5 list the steps and designs for the mother Wavelet $\psi_k(k)$ to the generate multi-resolution Wavelet time response for scale and translation parameters. Claim 6 has been amended to list the properties of the Wavelets in claims 1-5.

12. Claim Rejections - 35 USC § 112

Objections to claim 1-6 are believed to have been corrected in the amended claims which particularly point out and distinctly claim the subject matter which is regarded as the invention.

"Scale" is defined in the clean version of the amended claim 3 in lines 9-10 in page 5. "Scale" parameters are the dilation p, symbol interval M, and symbol length L and wherein p can be either positive or negative. "Scale" parameter p in current Wavelets is restricted to positive values.

Translation parameters q,k are defined in claim 3 in lines 11-13 in page 5.

"Fourier harmonics $\psi_k(k)$" are defined in the clean version of the amended claim 1 in lines 4-15 in page 2 in the inverse

discrete Fourier transform format which derives the time response $\psi(n)$ as a function of the frequency response harmonics $\psi_k(k)$. Designation of $\psi_k(k)$ as "design harmonics" is in the clean version of the amended claim 3 in line 17 in page 5.

13. Claim Rejections - 35 USC § 112

"Means" has been eliminated in the amended claims.

14. Claim Rejections - 35 USC § 112

Amended claims 1-6 have been rewritten to eliminate the objection that the claims are "narrative in form and replete with indefinite and functional or operational language".

Amended claims 1-2 clearly and positively define the steps comprising the method for designing the LS algorithms using design coordinates $\psi_k(k)$ to find the optimum $\psi(n)$ for implementation and using one sentence formats. Likewise claims 3-5 clearly and positively define the steps and design parameters to enable $\psi_k(k)$ in claim 1-2 to generate the multi-resolution Wavelet examples. Claim 6 clearly and positively summarizes the properties of the new Wavelets which are the subject matter of this invention.

15,16 Claim Rejections - 35 USC § 101

Amended claims 1-2 are believed to be in compliance under 35 USC § 101 since they define in clear detail the steps in the new method for designing the mother Wavelet time response $\psi(n)$ which is the format required for direct implementation in communications and radar applications.

Amended claims 3-5 are believed to be in compliance under 35 USC § 101 since they define in clear detail the steps and design parameters for generating the multi-resolution Wavelet time response for scales p,M,L and sampling rate 1/T from $\psi(n)$

using the design harmonics $\psi_k(k)$ for the mother Wavelet and which time response is the format required for direct implementation in communications and radar applications and which mplementations will add the translations q,k.

Amended claim 6 is in compliance under 35 USC § 101 since it lists the properties of the Wavelets for implementation in communications and radar transmitters and receivers.

Demonstrated performance for linear communications, BEM, SAR is summarized in the specification drawings in FIG. 4,7,8 respectively.

17,18 Claim Rejections - 35 USC § 102

Amended claims 1-6 are believed to be in compliance under 35 USC § 102 since the amended claims 1-6 clearly define the subject matter of this invention that was not patented or described in a printed publication prior to this invention application and was not anticipated by prior art summarized in pages 2-8 in the specification.

In claims 1-2 prior art Wavelet and FIR filter designs select time domain coordinates $\psi(n)$ to optimize performance for this baseband waveform whereas this invention replaces $\psi(n)$ with $\psi_k(k)$, combines Wavelet and FIR requirements, and finds the optimum $\psi_k(k)$ to generate the optimum $\psi(n)$ at baseband and for all scales p,M,L and all translations q,k.

Claims 3-5 demonstrate how $\psi_k(k)$ generates the optimal baseband time response $\psi(n_p)$ wherein n_p is the sample index for scale p, when scale p down-samples or equivalently dilates the digital sampling, when scale p dilate M,L at a constant sample rate, when scale p up-samples, and by obvious implication for any set of scales p,M,L and design parameter 1/T. Current

Wavelets can only be dilated or dowm-sampled using scaling equations or equivalently the trellis construction in FIG. 2. Current FIR designs support up-sampling followed by a bandwidth limiting filter.

Application examples in FIG. 6,7,8 demonstrate improved performance offered by combining Wavelet and FIR requirements.

18. Claim Rejections - 35 USC § 102

Amended claims 1-6 are believed to clearly demonstrate they have not been anticipated by prior art in compliance with 35 USC § 102.

¶1 of the "Office Action" correctly observes that prior art on pages 2-8 provides methods for designing waveforms and filters and the Wavelet art in lines 15-35 in page 5 defines the multi-resoluion Wavelet as a function of the mother Wavelet at baseband. This definition enables the mother Wavelet to generate multi-resolution waveforms at lower bandwidths to tile the time-frequency t-f space in Figure 1 using the procedure described in lines 6-16 in page 7. There is no mention of "using a subset of the Fourier harmonics as the desicn coordinates (harmonics) specifying the waveform design" and no mention of "design harmonics" in prior Wavelet art and in prior waveform and filter art. In line 15 in page 2 to line 4 in page 4 the waveform and filter design techniques in categories C1 to C7 including the Wavelet in category C5 are described. There is no prior art suggesting the concept of a "means for using the design harmonics and frequency translation property to generate wavelet waveforms at multiple scales and frequencies". "Frequency translation" is a common property of all waveform and filter design except possibly category C7.

¶2 of the "Office Action" correctly observes that prior art in pages 2-8 discloses in lines 15-37 in page 5 the Wavelet

equation, properties, and its use for generating multi-resolution Wavelets at scale p with time translation q which can be used to tile the t-f space in Figure 1 as described in lines 6-16 page 7. Scale p is a dilation parameter which means the mother Wavelet at scale p=0 can generate multi-resolution replicas at scales p=1,2,…. corresponding to reductions in sample rate rate bandwidth by the factor 2^p and a stretching by the factor 2^p to tile the t-f space in Figue 1. Another method to tile the t-f space uses the iterated filter bank construcion in line 18 page 8 to line 10 page 9 to generate the multi-resolution Wavelets at scales "p=1,2…" with a reduced capability to design the multi-resolution Wavelets to be replicas of the mother Wavelet due to the multi-stage filtering impacts. Wavelets are real so the multi-resolution Wavelets are real. There is no concept nor use of "Fourier harmonics" as design harmonics since all implementations are in the time domain as convolutions and sub-sampling operations. Frequency response is a performnce metric of this design.

Current Wavelet multi-resolution Wavelet generation is restricted to p=1,2,… with corresponding subsampling reducing the Nyquist bandwidth 1/T to 1/T2^p. The new Wavelets support the design of multi-resolution waveforms with this dilation as well as with dilation of bandwidth with constant 1/T, negative values for scale p corresponding to up-sampling, and complete flexibility in the control of the scale parameters p,M,L. and the design sampling rate 1/T. Design coordinates $\psi_k(k)$ for the mother Wavelet generate all of these multi-resolution waveforms as demonstrated in claims 3-5.

¶2 of the "Office Action" correctly observes that prior art in line 15 page 3 to line 4 page 4 includes designing waveforms and filters using analytical equations such as the square-root

raised-cosine definition of a FIR waveform time response that allows it to generate multi-resolution waveforms, iterative design techniques such as the Remez Exchange and eigenvalue LS techniques for designing filters with passband and stopband requirements, and polyphase filters which have multi-resolution capabilities. There is no concept nor use of "Fourier harmonics" as design harmonics since all implementations are in the time domain. Frequency response is a performnce metric of these designs.

19. Response to Amendment

The Matlab code has been deleted from the drawings and its description has been deleted from the specification. Amended substitute specification is the original specification with some minor editing corrections. Amended drawings are the original drawings with some minor edition corrections including your requested insertion of "Prior Art" in the legend of drawings 1-2. Abstract has been amended to follow your guidelines and consists of 144 words. Claims 1-2 have been amended to clearly define the method for designing the mother Wavelets described in the specification. Claims 3-5 illustrate the derivation of multi-resolution Wavelets from the mother Wavelets in claims 1-2 using the equations defined in the specification. Claim 6 summarizes the claimed properties of the new Wavelets disclosed in claims 1-5.

Objection 1 is believed to be satisfied in that the claims only refer to matter in the specification.

Objection 2 referencing lines 13-35 page 9, Figure 5, and Matlab code pages 37-44 is believed to be satisfied in that the Matlab code 5.0 and all reference to it has been deleted both from the amended drawings and the substitute specification.

20. Response to Arguments

The amended claims 1-6 have been rewritten to address your objections. Your detailed objections and recommendations were most helpful.

21. Response to Arguments

I am extremely grateful for pointing out all of my mistakes and lack of understanding of the USPTO rules.

Thanks ever for all of your help and guidance.

Sincerely,

Urbain A. von der Embse

Name Urbain A. von der Embse
Contact No. 310.641.0488
Address Urbain A. von der Embse
7323 W. 85th St.
Westchester, CA 90045-2444